

SOV/56-36-6-13/66

24(5)

AUTHOR:

Shul'man, L. A.

TITLE:

On the Theory of the Spin-electron Resonance of the F-Centers  
in Crystals With the Lattice-type of NaCl (K teorii spin-  
elektronnogo rezonansa F-tsentrów v kristallakh s reshetkoy  
tipa NaCl)

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,  
Vol 36, Nr 6, pp 1709-1716 (USSR)

ABSTRACT:

The paramagnetic resonance absorption of radiofrequencies by  
F-centers has already been repeatedly investigated both ex-  
perimentally and theoretically. The theoretical investigations  
are based either on the de Boer model, according to which the  
F-centers are looked upon as vacancies of negative ions con-  
taining an electron, or upon the Hilsch-Pohl model, according  
to which the F-centers are considered to be the excess ions of  
a metal, where there are electrons. The present paper first  
discusses a large number of earlier papers, and the ground  
state of the F-center is theoretically investigated both  
according to the de Boer model and also according to the  
Hilsch-Pohl model. In the following chapter the coupling con-

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stant of the spin Hamiltonian is calculated (according to the de Boer model) in consideration of the overlapping of the eigenfunctions of the neighboring ions for the F-centers in molecular orbit approximation; also the anisotropy of the spin Hamiltonian is taken into account. On the basis of the molecular orbit method a theory of the r.f.absorption by F-centers is developed; this theory is free from parameters and makes it possible to compare calculated with experimental data (Refs 7,8). In the next chapter the absorption theory for radiowaves by F-centers for the model by Hilsch and Pohl (also in molecular orbit approximation) is developed; the hyperfine interaction between the F-center electron and magnetic moments of the nuclei of the first and second coordination spheres were taken into account. It was found that the character of the paramagnetic resonance absorption spectra for the two models of F-centers differs essentially, which fact has already been established by other authors (Refs 11,12). It is thus possible, from the shape of the absorption bands (shape and width, figures 1 and 2), to draw conclusions as to the F-center model suited for the crystal under investi-

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gation. Good agreement is attained by a comparison of theoretical and experimental data for the KCl-crystal. The author finally thanks M. F. Deygen for suggesting the subject and for his interest in this investigation. There are 2 figures, 1 table, and 17 references, 8 of which are Soviet.

ASSOCIATION: Tadzhikskiy gosudarstvennyy universitet (Tadzhik State University)

SUBMITTED: October 3, 1958

Card 3/3

SHUL'GIN, L. A., Cand Phys-Math Sci (diss) "A theory for the electron-spin resonance of F-centers in ionic crystals with a lattice similar to NaCl,"  
Stalingrad 1960, 11 pp, (Central Asian State University imeni V. I. Lenin).  
(KL, 40-40, 120)

86814

S/185/60/005/001/014/018  
A151/A029

300(3203, 1043, 1044)

AUTHOR: Shul'man, I.A.

TITLE: The Spin-Electronic Resonance in F-Centers

PERIODICAL: Ukrayins'kyy Fizychnyy Zhurnal, 1960, Vol. 5, No. 1, pp. 117 - 119

TEXT: The paper discusses the resonance absorption of radio-frequencies by an ion crystal which contains F-centers. The F-center is an electron localized in the two nearest vacancies which have a contrary symbol. A smoothened wave function of the basic state of a crystal containing F-centers differs considerably from the spherically-symmetrical smoothened function of the F-center (Ref. 1). When the calculation of the width and the shape of the absorption band of a spine-resonant crystal with an F-center is based on the application of the wave function of the F-center (continuous model), then the shape of the band will be close to that of Gauss, the width of the band, however, will somewhat decrease as compared to the results for the crystal with a F-center. This decrease is connected with the absence of one positive ion. As shown in this paper, qualitatively better results can be obtained from the investigation of the paramagnetic absorption in a crystal with F-centers. This investigation is based on a molecular-orbital approximation. In this connection, it is possible to draw a con-

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## The Spin-Electronic Resonance in F-Centers

clusion from the experimental data, which produces a more favorable description of the properties of the F-center according to its models (Refs. 2 and 3). In the case of this comparison, one should bear in mind that the application criteria of the macroscopic approximation for the alkaline-haloide crystals (for which a calculation is made in this paper) are not very exact. A series of numerical calculations made by the author leads to the following results: for the crystal KCl  $\Delta h \approx 75$  Oe,  $h_m = 38$  Oe,  $\mu = 0.04227$ ,  $\gamma = 4.942$ ; for the crystal NaCl  $\Delta h \approx 253$  Oe,  $h_m = 65$  Oe,  $\mu = 0.02164$ ,  $\gamma = 6.586$ . In both cases, the parameters of  $\gamma$  correspond to the lowest energy value. The shape of the bands is similar to that investigated in References 7 and 8 according to Hilsh (Hil'sh) and Pole (Pol) for the F-centers, but here the parameters of the bands are different. As seen from the data presented, the individual maxima in the band can be solved experimentally. The derived values of the absorption band parameters show that the phenomenon of the spin-electronic resonance can be utilized as a method for finding the F-centers. It should be pointed out that the calculation carried out is rather approximate, since the polarization of the surroundings by the localized electron, as well as its interaction with the nuclei of the other coordination sphere, were not taken into consideration. It was assumed that the nuclei were fixed in the units of the lattice. The consideration of these factors, however, should not

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The Spin-Electronic Resonance in F-Centers

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A151/A029

change the obtained results from the qualitative point of view. In closing, the author thanks M.K. Deyhen for the discussion of results and for the valuable remarks. There are 8 references: 7 Soviet and 1 English.

ASSOCIATION: Tadzhikskyy derzhavnyy universytet im. V.I. Lenina (Tadzhik State University imeni V.I. Lenin)

SUBMITTED: September 16, 1959

X

Card 3/3

S/159/62/000/006/001/032  
EO52/E514

AUTHOR: Shul'man, L.A.

TITLE: On the shift in the g-factor in the molecular-orbital model of an F-centre

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika, no. 6, 1962, 5 - 7

TEXT: It is noted that the magnitude of the g-factor differs from the result for an atomic s-electron by  $10^{-2}$  -  $10^{-3}$ . The present paper is concerned with a theoretical discussion of this difference on the molecular-orbital approximation (second-order perturbation theory). The only experimental parameter which is introduced into the analysis is the energy difference between the ground and the first excited state of the F-centre ( $\Delta E$ ). The analysis is based on the following approximate expression for the g-factor difference

$$\Delta g \approx \frac{e}{2m^2 c^2} \cdot \frac{1}{\Delta E} \langle 0 | \hat{L}_z [E \times p]_z + [E \times p]_z L_z | 0 \rangle \quad (3)$$

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S/139/62/000/006/001/032  
E032/E314

On the shift in ....

where  $E$  is the microscopic electric field,  $p$  is the momentum and  $L$  the angular momentum. The analysis is confined to the interaction with ions in the first coordination sphere and an explicit expression is obtained for  $\Delta g_A$ . The final calculated result for KCl, KBr and KI is  $-4.55 \times 10^{-4}$ ,  $-4.87 \times 10^{-4}$  and  $-4.81 \times 10^{-4}$ . The measured values reported by G. A. Noble (J.Chem.Phys., 31, 931, 1959) are  $-7 \times 10^{-3}$ ,  $-1.6 \times 10^{-3}$  and  $-3.2 \times 10^{-3}$ . The agreement is slightly improved by taking into account ions in the second coordination sphere. The expression for the wave function for the ground state of the F-centre is taken in the present analysis to be in the form

$$\Psi = N \sum_{k=1}^6 \psi_k(r_k), \int |\Psi|^2 d\tau = 1 \quad (7)$$

where  $N$  is a normalizing factor,  $\psi_k$  are the normalized s-eigenfunctions for isolated atoms in the first coordination sphere and  $r_k$  is the distance between the nucleus of the k-th ions to the F-centre electron. It is suggested that a better

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On the shift in ....

S/139/62/000/006/001/032  
E032/E514

agreement with experiment might be obtained by taking the p-  
functions into account in Eq.(7). There is 1 table.

ASSOCIATION: Tadzhikskiy gosuniversitet imeni V.I. Lenina  
(Tadzhik State University imeni V.I. Lenin)

SUBMITTED: September 7, 1961

Card 3/5

S/051/63/014/002/006/026  
E039/E120

AUTHOR: Shul'man, L.A.

TITLE: On the shape and width of the electron paramagnetic resonance absorption curves of F-centers in crystals

PERIODICAL: Optika i spektroskopiya, v.14, no.2, 1963, 220-227

TEXT: Expressions are obtained for the second and fourth moments of electron paramagnetic resonance (EPR) lines of F-centers which depend on hyperfine interactions of localized electrons with the magnetic moment of the nuclear lattice surrounding a negative ion vacancy. The value of the half width of absorption bands with Gaussian form is calculated from the formula:

$$(\Delta\nu)_{1/2} = 2.35 \sqrt{(\Delta\nu)^2} \quad (34)$$

Values of the half width of the absorption bands for a series of alkali halide salts calculated from this expression are compared in the table with the experimental results of a number of authors, and good agreement is obtained. Given in the last column is a value for  $(\Delta\nu)^4 / 3 [(\Delta\nu)^2]^2$

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On the shape and width of the ...

S/051/63/014/002/006/026  
E039/E120

for three directions of the static magnetic field: a)  $H \parallel (100)$ ;  
b)  $H \parallel (110)$ ; c)  $H \parallel (111)$ . As seen from the table this ratio  
for the series of crystals examined is nearly unity, hence the  
absorption approximates to Gaussian. The anisotropy connected with  
the fourth moment is very small.

There is 1 table.

The sources referred to in the table are as follows.

- [12] K. Morigaki, J. Phys. Soc. Japan, v.16, 1961, 1645.
- [14] E.E. Schneider, Arch. Sci., v.10, 1957, 120.
- [15] K. Fukuda, H. Matsumoto, A. Okuda.  
J. Phys. Soc. Japan, v.14, 1959, 969.
- [1] A.F. Kip, C. Kittel, R.A. Levy, A.M. Portis.  
Phys. Rev., v.91, 1953, 1066.

SUBMITTED: March 13, 1962

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On the shape and width of the ...

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Table

Crystal	$(\Delta H)_{1/2}$ , 0e		Source of experimental data	$\frac{(\Delta v)^4}{3 [(\Delta v)^2]^2}$
	Calculated	Experimental		
$Li^7F^{19}$	89.3	90.5	[12]	a) 0.9206 b) 0.9235 B) 0.9243
$Li^7Cl^{35}$	- 57.7	90 60	[14] [15]	a) 0.9652 b) 0.9665 B) 0.9669
$K^{39}Cl^{35}$	53.6	54	[1]	a) 0.9475 b) 0.9481 B) 0.9482
$Na^{23}Cl^{35}$	149.5	162	[1]	a) 0.9337 b) 0.9349 B) 0.9351

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L 1971-66 EVT(1)/EWP(e)/EWT(m)/EPF(c)/EWP(i)/T/EWP(t)/EWP(b) IJP(c) JD/GG/WH

ACCESSION NR: AP5020314

AUTHOR: Danil'chuk, G. S.; Ganyuk, L. N.; Koval'skiy, A. Ye.; Pogoretskiy, P. P.  
Podzyarey, G. A.; Shul'man, L. A.

UR/0379/65/001/003/0367/0372

59

56

B

44,55

TITLE: Nitrogen impurity centers in synthetic diamond powders

SOURCE: Teoreticheskaya i eksperimental'naya khimiya, v. 1, no. 3, 1965, 367-372

TOPIC TAGS: diamond, electron spin resonance, impurity center, donor center, nitrogen, coupling constant, magnetic moment

ABSTRACT: A distinguishing feature of the study was the use of polycrystalline diamond samples (powders), all previous studies having been made on single crystals. The object of the work was to study in close detail the electron spin resonance (ESR) of nitrogen donors in synthetic diamond at room temperature, to determine the coupling constants of the Hamiltonian

$$\hat{H} = g\mu(H_s) + a(sI) + b[3s_zI_z - (sI)], \quad (1)$$

on the basis of a study of the form of asymmetrical side satellites of the spectrum, and to investigate the infrared absorption by the powders and compare the results

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ACCESSION NR: AP5020314

with the ESR data. The value of the g-factor was found to be  $2.0025 \pm 0.0005$ . The method of moments was used to study the form of the asymmetrical side peaks of the spectrum, and from this, the coupling constants of hyperfine interaction of the donor electron of nitrogen with its magnetic moment were determined. The coupling constants obtained agreed well with the corresponding values for single crystals of natural diamond. The concentration of donor nitrogen centers was found to be equal to  $10^{18}$ - $10^{19} \text{ cm}^{-3}$ . In the infrared spectrum of synthetic and natural diamond, an absorption band was observed at  $9.1 \mu$  which is displayed more rarely in synthetic diamond; it was postulated that this band is primarily due to aggregated nitrogen centers. Orig. art. has: 2 figures, 1 table, and 8 formulas.

ASSOCIATION: Ukrainskiy NII sinteticheskikh sverkhtverdykh materialov, Kiev  
(Ukrainian Scientific Research Institute of Synthetic Ultrahard Materials)

SUBMITTED: 31Dec64

ENCL: 00

44,55  
SUB CODE: GC, IC

NO REF SOV: 008

OTHER: 008

Card 2/2 SP

DANIL'CHUK, G.S.; GANYUK, L.N.; KOVAL'SKIY, A.Ye.; POGORETSKIY, P.P.;  
PODZYAREV, G.A.; SHUL'MAN, L.A.

Impurity centers of nitrogen in synthetic diamond powders.  
Secret, i eksper. khim. l no.3:367-372 My-Je '65.

(MIRA 18:9)

1. Ukrainskiy nauchno-issledovatel'skiy institut sinteticheskikh  
sverkhvysokikh materialov, Kiyev.

L 38701-66 EWP(c)/EWT(m)/EWP(t)/ETI IJP(c) JD  
ACC NR: AP6017526 (A) SOURCE CODE: UR/0379/65/001/006/0830/0833

AUTHOR: Shul'man, L. A.; Podzyarey, G. A.

ORG: Ukrainian NII of Superhard Materials, Kiev (Ukrainskiy NII sinteticheskikh sverkhtverdykh materialov)

TITLE: Dipole-dipole and exchange interaction in nitrogen impurity centers in synthetic diamonds

SOURCE: Teoreticheskaya i eksperimental'naya khimiya, v. 1, no. 6, 1965, 830-833

TOPIC TAGS: diamond, EPR spectrum, dipole interaction, impurity center

ABSTRACT: A critical review is given of EPR spectra of synthetic polycrystalline diamonds containing nitrogen impurities. The EPR spectrum taken at room temperature is shown in Fig. 1. The weak lines ( $\alpha$ ) are assigned to the exchange interaction among the atom pairs within the diamond lattice. Such weak lines were found to be characteristic for synthetic diamonds containing nitrogen impurities of the order of  $10^{20}$  per cubic centimeter. Orig. art. has: 1 figure and 6 formulas.

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L 38701-66  
ACC NR: AP6017526

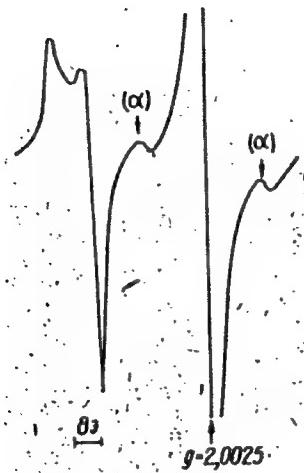


Fig. 1.

SUB CODE: 11,20 / SUBM DATE: 03May65 / ORIG REF: 006 / OTH REF: 005

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ACC NR: AP6024490

SOURCE CODE: UR/0181/66/008/007/2213/2217  
41  
38  
B

AUTHOR: Ryabchenko, S. M.; Shul'man, L. A.

ORG: Institute of Physics AN UkrSSR, Kiev (Institut fiziki AN UkrSSR)

TITLE: Influence of strong exchange interaction in  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$  crystal on the EPR line broadening

SOURCE: Fizika tverdogo tela, v. 8, no. 7, 1966, 2213-2217

TOPIC TAGS: copper compound, chloride, epr spectrum, line broadening, exchange interaction

ABSTRACT: The effect of the exchange interaction on the EPR line broadening was investigated by the method of moments. The exchange interaction is assumed to exceed the Zeeman interaction. The measurements were made at 9320 Mcs at 300, 77, and 20.4K, and the exchange constants were evaluated for the three temperatures. The second and fourth moments of the EPR absorption curve were then calculated, from which the isotropic exchange interaction with the ion in the second coordination sphere is estimated to be  $3 \times 10^{-17}$  erg. The values of coefficient of anisotropic exchange interaction with the ion of the first coordination sphere were calculated from the second and from the temperature-dependent first moments of the absorption curve, and found to be  $J_{aa} = -2.6 \times 10^{-17}$ ,  $J_{bb} = -2.3 \times 10^{-17}$ , and  $J_{cc} = +4.8 \times 10^{-17}$  erg. The

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ACC NR: AP6024490

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various assumptions made in the calculations are discussed. The results are in satisfactory agreement with the theoretically expected values. The authors thank A. F. Prikhot'ko and M. F. Deygen for valuable hints and a discussion of problems touched upon in the paper, and V. S. Frolova for preparing the samples. Orig. art. has: 7 formulas

SUB CODE: 20/ SUBM DATE: 26Nov65/ ORIG REF: 003/ OTH REF: 015.

Card 2/2 *Off*

L 04141-67 EWT(1)/EWP(e)/EWT(m)/I/EWF(t)/ETI IJP(s) JD/MH  
ACC NR: AP6026674 SOURCE CODE: UR/0181/66/008/008/2307/2312

47  
B  
15

AUTHOR: Shul'man, L. A.; Zaritskly, I. M.; Podzyarey, G. A.

ORG: Institute of Superhard Materials, Kiev (Institut sverkhvseydykh materialov)

TITLE: Reorientation of the Jahn-Teller displacement in nitrogen impurity centers in diamond

SOURCE: Fizika tverdogo tela, v. 8, no. 8, 1966, 2307-2312

TOPIC TAGS: impurity center, nitrogen, diamond, EPR, NMR, single crystal structure, crystal dislocation

ABSTRACT: The dynamic manifestation of the Jahn-Teller (J-T) effect in diamonds with nitrogen content is investigated by means of a radio spectrometer over a temperature range from 77 to 870K. The changes with temperature of the EPR spectra of nitrogen obtained both for natural diamond single crystals and synthetic polycrystalline diamond are examined. At temperatures below 570K, the localization of an excess nitrogen electron on a given C-N pair, and the corresponding J-T displacement in the C-N pair are practically "frozen." With increasing temperature, the increased thermal mobility of the particles may lead to a reorientation of the J-T displacement, the reorientation frequency increasing with temperature. This permits the electron to overcome a certain potential barrier and to localize at a neighboring C-N pair. The

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ACC NR: AP6026674

process repeats itself, and may be interpreted as a dynamic manifestation of the J-T effect. The reorientation of the J-T displacement can be described in analogy with the process of retarded rotation of molecular complexes, observed in NMR. The authors are indebted to T. A. Nachal'naya for taking part in the processing of the experimental data. Orig. art. has: 3 figures and 6 formulas.

SUB CODE: 20<sup>08</sup> SUBM DATE: 22Nov65/ ORIG REF: 008/ OTH REF: 005

Card

2/2

*7th*

SHIROKOV, Sergey Ivanovich, inzh. [deceased]: Prinimali uchastiye:  
ZAYETS, V.N., dotsent; GUREVICH, M.I., dotsent. STADNIKOV, G.D.,  
inzh., retsenzent; SHUL'MAN, L.G., inzh., retsenzent; DUGINA,  
N.A., tekhn.red.

[Production of boilers] Kotel'noe proizvodstvo. Izd.3. Moskva.  
Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1960. 280 p.  
(MIRA 14:3)

(Boilers)

3,1710  
3,1700

40046  
S/194/62/000/006/169/232  
D201/D308

AUTHOR: Shul'man, L.M.

TITLE: A possibility of increasing the resolving power of radio-telescopes

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 6, 1962, 37, abstract 6Zh251 (Visnik Kyyivs'k, un-tu, 1960 (1961), no. 3, ser. astron., fiz ta khimiy, no. 2, 117-123)

TEXT: The author proposes a new method of decreasing the beam-width of interferometers in one plane by means of angular separation of diagrams of two aerials and by separating the radiation coming from the overlap region of both diagrams. The effective power diagram of such a system is determined by the equation  $F(\varphi) = c^2$

$[(f_1 + f_2) - (f_1 - f_2)]^2$ , where  $f_1(\varphi)$ ,  $f_2(\varphi)$  are voltage radiation patterns of separate aerials. It is shown that such a method can be realized by means of using double modulation of the signal: 1) By periodical switching of the receiver from the aerial over to the

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A possibility of increasing the ...

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D201/D308

aerial equivalent with a frequency  $\Omega_1$ ; 2) By periodically connecting two aerials in phase and out of phase at a frequency  $\Omega_2 \ll \Omega_1$ .  
Principles of separating out the necessary signal are discussed. It is shown that it is possible to increase the resolving power four or more times. [Abstracter's note: Complete translation.]

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L 16877-63      EWT(1)/FCS(k)/FBD/FCC(w)/BDS/EED-2/ES(t)-2/ES(v)/EEC-2    ASD/  
ESD-3/APGC/AFFTC    Pi-4/Pj-4/P1-4/Pe-4    PT-2/WR  
ACCESSION NR: AR3006332      S/0058/63/000/007/H040/H040

SOURCE: RZh. Fizika, Abs. 7Zh272

86

AUTHOR: Shul'man, L. M.

TITLE: New method of increasing the resolution of radio telescopes

CITED SOURCE: Publikatsii Kiyevsk. astron. observ., no. 11, 1962,  
108-110

TOPIC TAGS: radio telescope, resolution, antenna spacing, antenna  
phasing

TRANSLATION: It is proposed to increase the resolving power of a radiotelescope by placing two antennas at one point in such a way that their diagrams in any plane are shifted relative to one another by an angle  $\delta\varphi$ ; by periodically switching the antennas from n-phase to antiphase connection and by separating the signal at the switching

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ACCESSION NR: AR3006332

frequency, it is possible to write down the intensity of radiation arriving from the region of the mutual overlap of the two diagrams. The resolving power of the radiotelescope is defined as the width of the principal lobe of the diagram at half power. A plot showing the dependence of the ratio  $\Delta\varphi/\Delta\varphi_0$  on  $\delta\varphi$  is presented ( $\Delta\varphi_0$  and  $\delta\varphi$  are the half-power widths of the diagrams of one antenna and of the system, respectively) and the ratio of the effective areas of the system and of one antenna for a specific antenna consisting of eight non-directional elements; the distance between elements is  $\lambda/2$ . When the diagram is narrowed down by 3--5 times, the gain decreases by 2--4 times. It is proposed to use this method to observe radio emission bursts from the sun. See also RZhFiz 1962, 6Zh251.

A. Khanberdiyev.

DATE ACQ: 15Aug63

SUB CODE: PH, AS

ENCL: 00

Card 2/2

L 22192-65 ENT(1)/EMG(k)/EPA(sp)-2/EMO(v)/EPA(w)-2/EEC(t)/T/EEC(b)-2/EWA(m)-2/  
 Pz-6/Po-4/Pab-10/Pe-5/Pae-2/Pi-4 IJP(c)/SSD(b)/AFWL/AEDC(a)/SSD/BSD/ASD(a)-5/  
 SSD(c)/AEDC(b)/ASD(f)-3/ASD(p)-3/AFETR/RAEM(c)/RAEM(a)/ESD(gs)/ESD(t) AT/CW  
 S/2555/64/010/000/0070/0073  
 ACCESSION NR: AT4049111

AUTHOR: Shul'man, L. M.

TITLE: Instability of the current layer in nonhomogeneously magnetized plasma <sup>B71</sup>

SOURCE: AN SSSR. Astronomicheskiy sovet. Voprosy\* kosmogonii, v. 10, 1964.  
 Problemy\* magnitnoy gidrodinamiki i kosmicheeskoy gazodinamiki (Problems in magnetic  
 hydrodynamics and cosmic gas dynamics), 70-73

TOPIC TAGS: astrophysics, plasma, magnetized plasma, magnetohydrodynamics,  
 cosmic gas dynamics

ABSTRACT: The problem of the stability of plasma near a surface separating regions  
 with magnetic fields of opposite sign has been investigated by many authors, but the  
 purpose of this study is an analysis of unidimensional nonadiabatic movements of plasma  
 near the neutral surface. It is shown that nonadiabatic movements under certain con-  
 ditions lead to instability. The author analyzes the unidimensional movements of plasma  
 across a magnetic field described by the system of equations: ..

$$\frac{\partial v}{\partial t} + v \frac{\partial v}{\partial x} + \frac{1}{\rho} \frac{\partial p}{\partial x} = 0; \quad (1)$$

$$\frac{\partial p}{\partial t} + v \frac{\partial p}{\partial x} + \rho \frac{\partial v}{\partial x} = 0; \quad (2)$$

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ACCESSION NR: AT4049111

$$\frac{\partial H}{\partial t} + v \frac{\partial H}{\partial x} + H \frac{\partial v}{\partial x} - v \frac{\partial^2 H}{\partial x^2} = 0; \quad (3)$$

$$\frac{\partial p}{\partial t} + v \frac{\partial p}{\partial x} + \left[ \gamma p + (2 - \gamma) \frac{H^2}{8\pi} \right] \frac{\partial v}{\partial x} - \frac{v}{4\pi} \left[ H^2 \frac{\partial H}{\partial x^2} + (\gamma - 1) \left( \frac{\partial H}{\partial x} \right)^2 \right] + (\gamma - 1) q = 0, \quad (4)$$

where  $p$  denotes the sum of the magnetic and gas pressures,  $\gamma$  is the adiabatic index,  $\nu$  is magnetic viscosity, and  $q$  is the thermal loss of a unit volume in a unit time. The initial system was written and is analyzed on the assumption that  $\gamma = \text{const}$ . At equilibrium the following applies

$$v = \frac{\partial r}{\partial t} = \frac{\partial r}{\partial x} = \frac{\partial H}{\partial t} = \frac{\partial p}{\partial t} = \frac{\partial p}{\partial x} = 0. \quad (4a)$$

This leads to the relation

$$p = \text{const}; \quad (5)$$

$$\frac{\partial H}{\partial x} = \text{const}; \quad (6)$$

$$(\gamma - 1) q = \frac{v}{4\pi} \left[ H \frac{\partial^2 H}{\partial x^2} + (\gamma - 1) \left( \frac{\partial H}{\partial x} \right)^2 \right]. \quad (7)$$

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L 22192-65

ACCESSION NR: AT4049111

The stability of plasma described by system (1)-(4) is strongly dependent on heat transfer, that is, on the specific form of the function  $q$ . The author considers two simple cases in detail: 1. Compression occurs isobarically; 2. At the time of compression the value  $q$  does not deviate from its equilibrium value (7). The results of the author's analyses show that plasma is unstable near the neutral plane due to its nonadiabatic behavior. (Although the method used for taking heat transfer into account is not fully justified and the dependence of magnetic viscosity on temperature is neglected, the author feels that these factors do not lessen the validity of the above conclusion.) "The author wishes to thank D. A. Frank-Kamenetskiy for assistance in formulating the problem and for valuable advice, as well as M. V. Konyukov for pointing out a possible objection." Orig. art. has: 16 formulas.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: AA, ME

NO REF SOV: 007

OTHER: 001

Card 3/3

SHUL'MAN, L.M.

Origin of atmospheric sodium. Geofiz. i astron. no.8:46-53 '65.

(MIRA 19:1)

1. Astronomiceskaya observatoriya Kiyevskogo gosudarstvennogo  
universiteta.

24712-66 EWT(1)/ETC(f)/EPF(n)-2/EWG(m) IJP(c) GS/AT/GW

ACC NR: AT6014847

SOURCE CODE: UR/0000/66/000/000/0095/0100

5.3

B71

AUTHOR: Shul'man, L. M.

ORG: none

TITLE: Selection of a preflare plasma state model  
2/

SOURCE: AN UkrSSR. Voprosy astrofiziki (Problems in astrophysics). Kiev, Izd-vo Naukova dumka, 1966, 95-100

TOPIC TAGS: solar physics, flare, flare model, chromospheric flare, plasma physics

ABSTRACT: Research at the Crimean Astrophysical Observatory has shown that during the flare process, plasma changes from an "excited" equilibrium state with excess magnetic energy into another equilibrium state accompanied by the transformation of magnetic field energy into kinetic and thermal plasma energy, or radiation and fast particle energy. Various quantitative model theories are examined to determine which best satisfies this qualitative explanation. The selection of models of the preflare plasma state is restricted by the condition that thermal and electrodynamic equilibrium must accompany the mechanical equilibrium. Model theories proposed by A. B. Severnyy, C. de Jager and M. Kuperus, G. M. Nikol'skiy and M. A. Livshits, J. W. Dungey, and P. A. Sweet are analyzed on this basis. The configuration proposed by Sweet is considered to correspond best with actual conditions. Orig. art. has: 12 formulas.

SUB CODE: 03/ SUBM DATE: 22Jan66/ ORIG REF: 013/ OTH REF: 004/ ATD PRSS: [DM]

L 24712-66 EWT(l)/ETC(f)/EPF(n)-2/EWG(m) IJP(c) GS/AT/GW.

ACC NR: AT6014847 SOURCE CODE: UR/0000/66/000/000/0095/0100

AUTHOR: Shul'man, L. M.

53  
BT/

ORG: none

1/

TITLE: Selection of a preflare plasma state model

SOURCE: AN UkrSSR. Voprosy astrofiziki (Problems in astrophysics).  
Kiev, Izd-vo Naukova dumka, 1966, 95-100

TOPIC TAGS: solar physics, flare, flare model, chromospheric flare,  
plasma physics

ABSTRACT: Research at the Crimean Astrophysical Observatory has shown  
that during the flare process, plasma changes from an "excited" equilibrium  
state with excess magnetic energy into another equilibrium state accompa-  
nied by the transformation of magnetic field energy into kinetic and  
thermal plasma energy, or radiation and fast particle energy. Various  
quantitative model theories are examined to determine which best satis-  
fies this qualitative explanation. The selection of models of the pre-  
flare plasma state is restricted by the condition that thermal and  
electrodynamic equilibrium must accompany the mechanical equilibrium.

Card 1/2

L 24712-66

ACC NR: AT6014847

Model theories proposed by A. B. Severnyy, C. de Jager and M. Kuperus, G. M. Nikol'skiy and M. A. Livshits, J. W. Dungey, and P. A. Sweet are analyzed on this basis. The configuration proposed by Sweet is considered to correspond best with actual conditions. Orig. art. has: 12 formulas.

DM

SUB CODE: 03/ SUBM DATE: 22 Jan 66/ ORIG REF: 013/ OTH REF: 004/

ATD PRESS:

Card 2/2 *pf*

*4245*

SHUL'MAN, L.N. (Kiyev)

Rupture of the aorta. Vrach. delo no.6:136-138 Je'63.  
(MIRAL6:9)

1. Kafedra terapii ( zav. - dotsent A.P.Peleghchuk) stomatologicheskogo fakul'teta Kiyevskogo meditsinskogo instituta i patologoanatomiceskaya laboratoriya (zav. - prof. V.L.Bylik) Kiyevskoy klinicheskoy bol'nitsy dlya obsluzhivaniya vodnikov.  
(AORTA ---WOUNDS AND INJURIES)

SHUL'MAN, L. *✓*

USSR/Miscellaneous-Metallurgy

Card 1/1

Authors : Belov, P. O., and Shul'man, L. *✓*

Title : Mechanization of industrial processes in a profiling steel melting plant

Periodical : Lit. Proizv. 1, 24 - 27, Jan-Feb 1954

Abstract : The workers of the steel melting plant of the Kirov steel mill developed a complex plan for the mechanization of industrial processes in various departments of the mill for the purpose of better and more economical distribution of labor forces. The details of the proposed mechanization plan are described. The planning, preparation and assembly of equipment were carried out within the plant, without outside help, by a specially organized group of engineers, mechanics and workers. Table, drawings.

Institution: ....

Submitted : ....

SHUL'MAN, M.

A camera, but which one: with a mirror or a range finder?  
Sov. foto 19 no. 4:43-47 Ap '59. (MIRA 12:5)  
(Cameras)

SHUL'MAN, M.

New developments in the design of cameras in foreign countries. Sov.  
foto 20 no.10:40-41 0'60. (MIRA 13:10)  
(Cameras)

VOROB'YEV, V.; SHUL'MAN, M.

Designers are working on these new developments. Sov.foto 21  
no.8:28-30 Sov.foto 21 no.8:28-30 Ag '61. (MIRA 14:8)  
(Cameras)

SHUL'MAN, M.

Lenses with variable focal distances. Sov.foto 22 no.11:34-36  
N '62. (MIRA 16:1)  
(Lenses, Photographic)

SHUL'MAN, M.

Twin-lens reflex cameras. Sov. foto 22 no. 12:34-36 D '62.  
(MIRA 16:1)

(Twin-lens cameras)

SHUL'MAN, M.G., podpolkovnik meditsinskoy sluzhby

Organization and activities of a blood transfusion center in a  
garrison hospital. Voen-med. zhur. no.9:66 S '51. (MLRA 9:9)  
(BLOOD--TRANSFUSION)

"APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2

SHUL'MAN, M.G.

Isolated subcutaneous gastric rupture. Khirurgia, no.4:86 Ap '55.  
(STOMACH--WOUNDS AND INJURIES) (MLRA 8:9)

APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2"

EL'KIN, M.L., nolkovnik med.sluzhby; SHUL'MAN, M.G., podpolkovnik med.sluzhby

Preventing surgical shock by injecting intravenously a 1/2 solution  
of novocaine. Voen.-med.zhur. no.11:71 N '57. (MIRA 11:4)  
(SHOCK) (NOVOCAIN)

SHUL'MAN, M.S., doktor med.nauk

Multiple cancer of the colon. Khirurgiiia Supplement:23 '57.  
(MIRA 11:4)

1. Iz Sverdlovskogo oblastnogo onkologicheskogo dispansera.  
(CLON--CANCER)

SHUL'MAN, M.S., doktor med.nauk

Extensive resection of the ileocecal angle in a case of sarcoma.  
Khirurgija 34 no.7:129 J1 '58 (MIRA 11:9)

1. Iz Sverdlovskogo oblastnogo onkologicheskogo dispansera.  
(ILEUM, neoplasms  
ileocecal sarcoma, surg. (Rus))  
(SARCOMA, case reports  
ileocecal, surg. (Rus))

SHUL'MAN, M.S., doktor med.nauk; KHARIN, L.A. (Sverdlovsk)

Case of primary sarcoma of the pleura. Klin.med. 37 no.12:129-131  
D '59. (MIRA 13:4)

1. Iz Oblastnogo onkologicheskogo dispansera g. Sverdlovsk (glavnyy  
vrach F.M. Teplokhova, zaveduyushchiy otdeleniem M.S. Shul'man).  
(PLEURA--TUMORS)

SHUL'MAN, M.S. (Sverdlovsk, ul. Kirova, d.7, kv.1)

Retroperitoneal and mesenteric tumors. Vsp onk. 10 no.8:105-109  
'64. (MIRA 18:3)

1. Iz Sverdlovskogo oblastnogo onkologicheskogo dispansera  
(glavnnyy vrach - I.A.Arkhangel'skaya).

5 (4)  
AUTHORS:

Kuznetsova, M. N., Shul'man, M. M.

SOV/79-29-5-69/75

TITLE:

Physico-chemical Analysis of the Reactions of Amines and Acids  
(Fiziko-khimicheskiy analiz vzaimodeystviya aminov i kislot).  
5. Thermal Analysis of the Three-component System Urea -  
Trichloroacetic Acid - Water (5. Termicheskiy analiz troynoy  
sistemy mochevina - trikhloruksusnaya kislota - voda)

PERIODICAL:

Zhurnal obshchey khimii, 1959, Vol 29, Nr 5, pp 1737 - 1739  
(USSR)

ABSTRACT:

Nine sections of the melting diagram  $H_2O - CCl_3COOH - CO(NH_2)_2$  were investigated (Figs 1 and 2). A visual method of thermal analysis was applied. As the diagram shows (Fig 3), the stability range of  $CO(NH_2)_2 \cdot CCl_3COOH$  covers 60.8% of the diagram surface. The section  $H_2O - CO(NH_2)_2 \cdot CCl_3COOH$  divides the diagram into two three-component systems:  
1)  $CCl_3COOH - H_2O - CO(NH_2)_2 \cdot CCl_3COOH$  with the eutectic point at  $-38.3^\circ$  and 2)  $H_2O - CO(NH_2)_2 - CO(NH_2)_2 \cdot CCl_3COOH$  with the eutectic point at  $-12.5^\circ$ .

Card 1/2

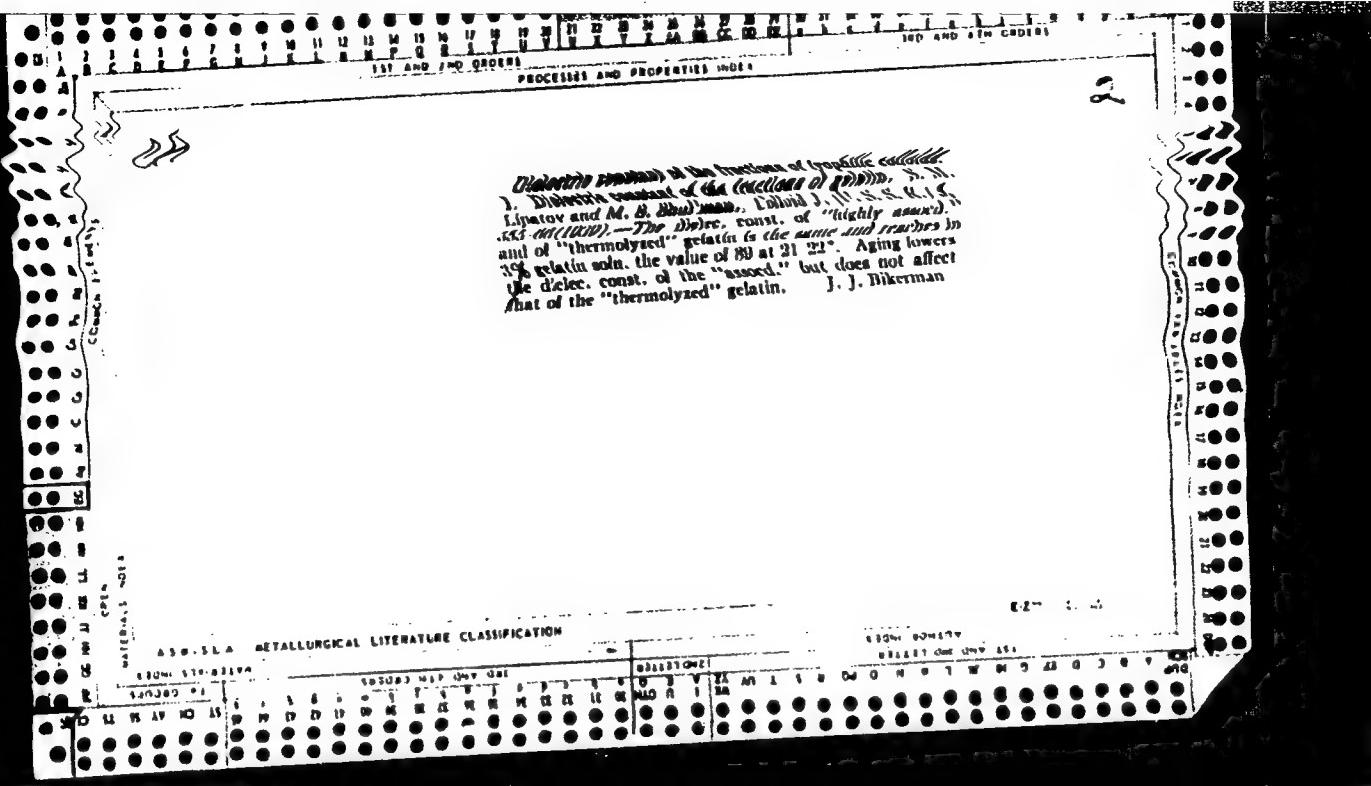
Physico-chemical Analysis of the Reactions of SOV/79-29-5-69/75  
Amines and Acids. 5. Thermal Analysis of the Three-component System Urea -  
Trichloroacetic Acid - Water

There are 3 figures and 7 references, 4 of which are Soviet.

ASSOCIATION: Moskovskiy tekhnologicheskiy institut myasnoy i molochnoy  
promyshlennosti (Moscow Technological Institute for the  
Meat Packing and Dairy Industry)

SUBMITTED: October 8, 1958

Card 2/2

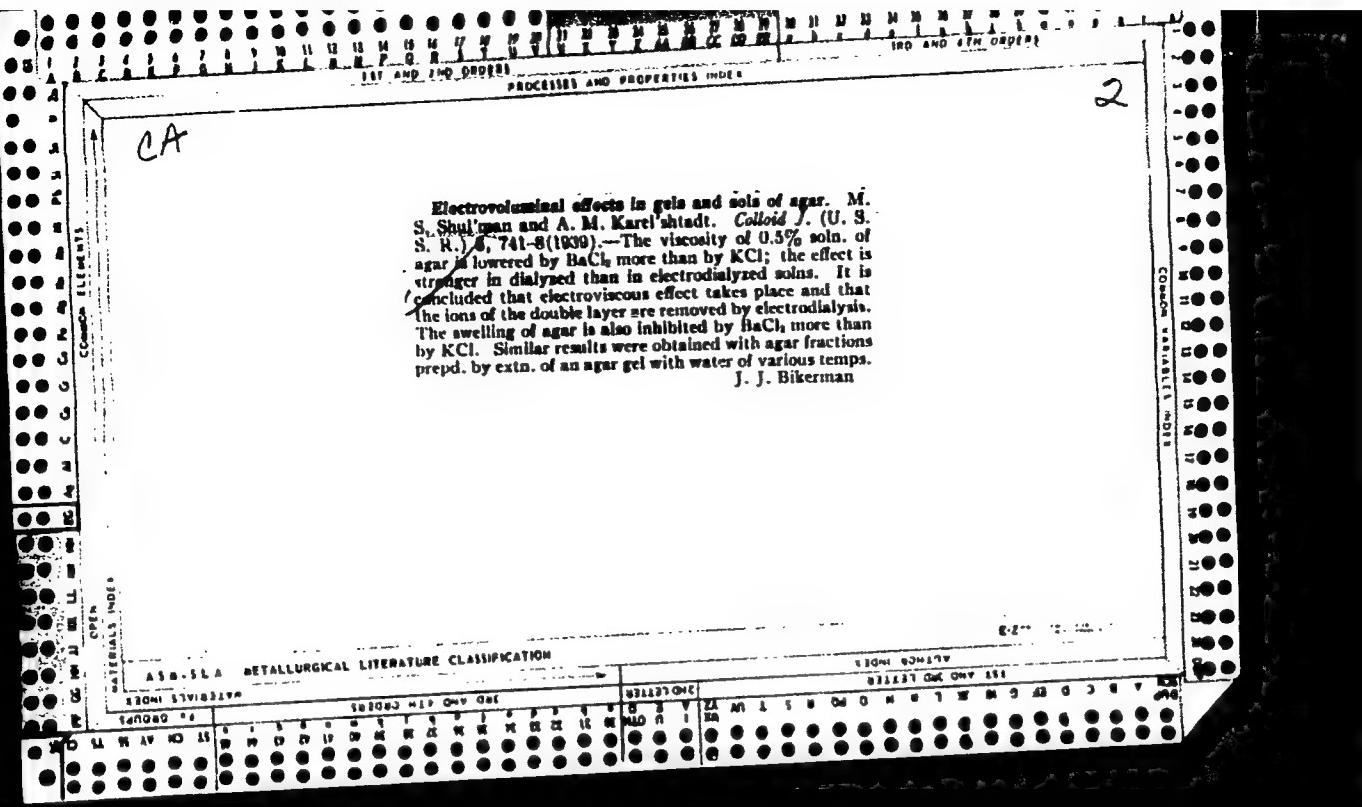


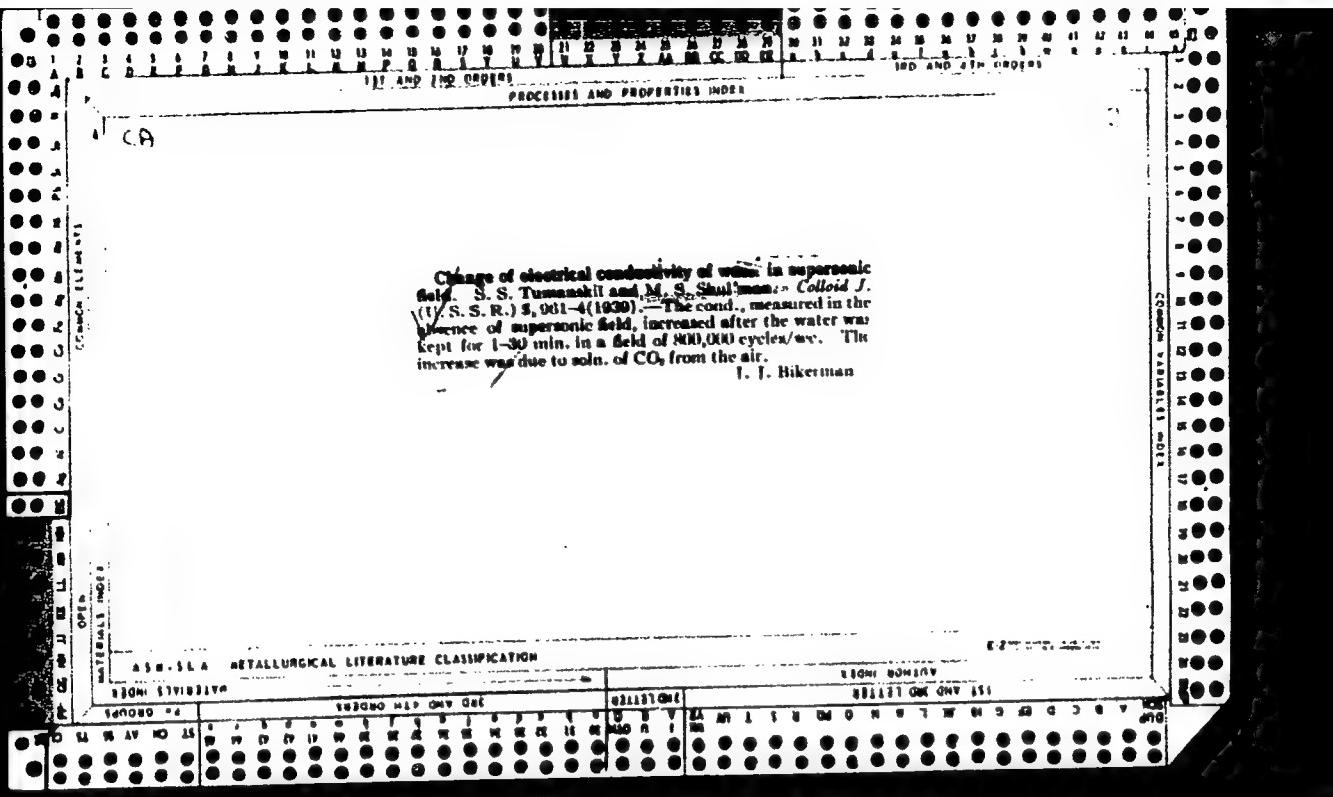
CA

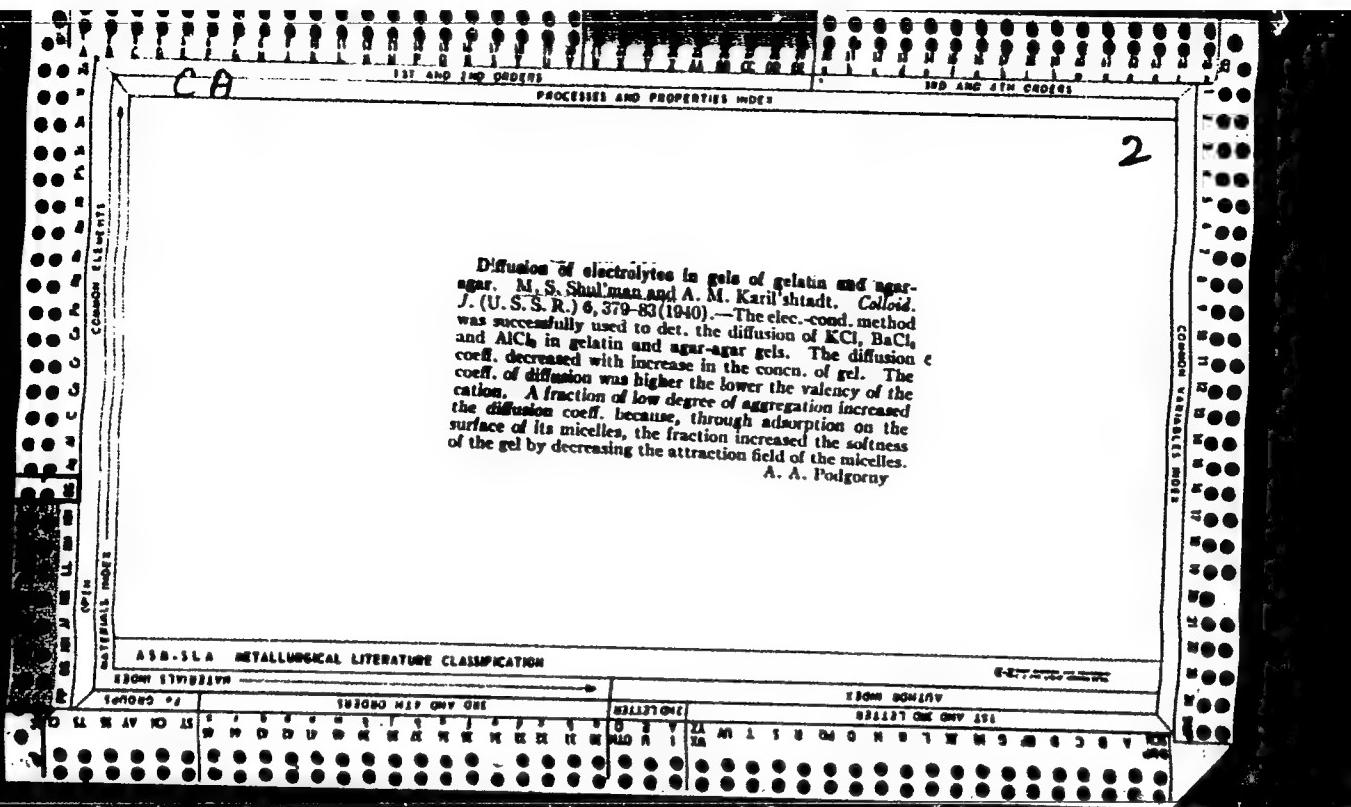
2

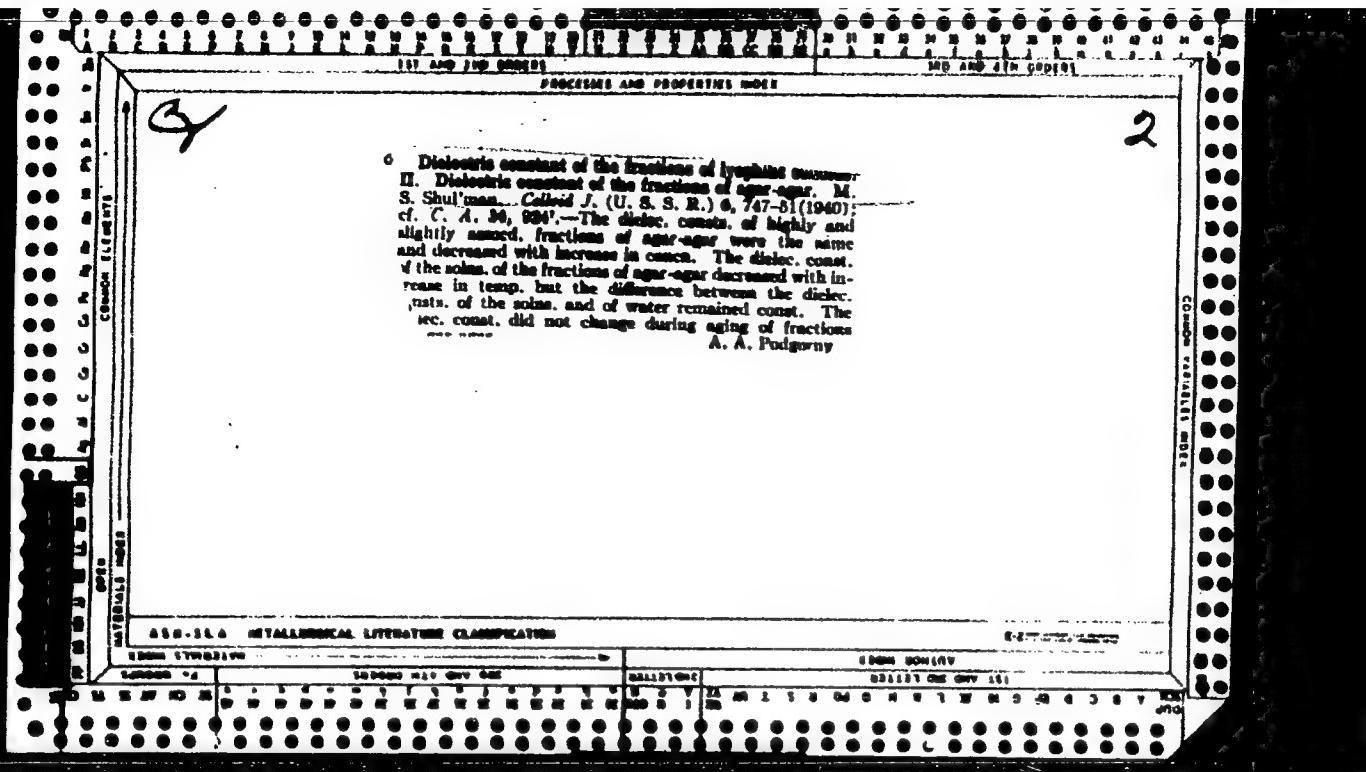
**Electrovoluminal effects in gels and sols of agar.** M. S. Shul'man and A. M. Karel'shtadt. *Colloid J. (U. S. S. R.)*, 6, 741-8 (1939).—The viscosity of 0.5% soln. of agar is lowered by BaCl<sub>2</sub> more than by KCl; the effect is stronger in dialyzed than in electrodialyzed solns. It is concluded that electroviscous effect takes place and that the ions of the double layer are removed by electrodialysis. The swelling of agar is also inhibited by BaCl<sub>2</sub> more than by KCl. Similar results were obtained with agar fractions prep'd. by extn. of an agar gel with water of various temps. I. J. Bikerman

J. J. Bikerman









Q A

Apparatus for determination of degree of swelling. M.  
S. Shul'man. Zavodskaya Lab. 16, 140(1950).—A  
buret fitted at its upper end into a rubber fitting carrying  
a porous-filtering crucible is used. The crucible is covered  
with a stopper provided with a stopcock. The buret is  
filled with  $H_2O$  from below and the specimen is placed in  
the crucible. The app. is inverted and a slight air pressure  
is used to fill the crucible with  $H_2O$ . After a given time  
interval the app. is re-inverted and the vol. of  $H_2O$  is again  
measured in the buret. The vol. change corresponds  
to the uptake by the specimen. G. M. Kosolapoff

Ail Inst. Alcohol Industry

CA

Twenty five years of the scientific activity of S. M.  
✓ Lipatov, Z. A. Rogovin and M. Shul'man. *Kolloid.*  
*Zhur.* 12, 158-9(1950). J. J. Bikerman

SHUL'MAN, N. S.

USSR/Chemistry - Starch

Sep/Oct 51

"Problem of the Electrochemistry of Starch. I. Electrical Conductivity of Solutions of Potato Starch," M. S. Shul'man, S. M. Lipatov, All-Union Sci Res Inst of Alc Ind

"Kolloid Zhur" Vol XIII, No 5, pp 383-387

Investigated elec cond of native and further dispersed starch at various frequencies. Showed that at wave lengths of 200 m and higher cond. is unaffected by frequency, and that self-cond of dextrinized and dispersed starch solns has practically the same magnitude. Established that

1968

USSR/Chemistry - Starch (Contd)

Sep/Oct 51

self-cond of starch solns corresponds to difference between cond. of soln and cond of suspension having starch concn or soln in question.

1968

CA

The electrochemistry of starch. II. Cataphoresis of solutions of potato starch. M. S. Shul'man and S. M. Lipatov. Kolloid. Zhur. 147-150 (1952); cf. C.A. 46, 2927A.—The cataphoretic mobility  $\mu$  of suspended starch (I) is  $0.07$  to  $1.07 \times 10^{-4}$  sq. cm./v. sec. independently of concentration (1-9%). while  $\mu$  of gelatinized starch (II) changes from  $1.84 \times 10^{-4}$  in 0.25% to  $0.91 \times 10^{-4}$  in 1% solution in 0.01 N NaCl,  $\mu$  of I has the same value, but  $\mu$  of II is lowered to 1.2 to  $0.6 \times 10^{-4}$  for the same concns. The sediment was dried in a U tube, and liquid decanted from starch. The cond. of 0.01 N NaCl was lowered by 7% when 0.5-1% II was added. J. J. Bikerman

A-II Sci Res Inst. Alcohol Industry

2

CA

Kinetics of the heating of starch in a high-frequency field.  
M. S. Shul'man, *Kolloid. Zhur.* 14, 215-18(1952); cf. *C.A.*, 46, 28274.—A test tube filled with starch was heated by high-frequency field. The excess,  $\Delta T$ , of the temp. of the starch above the room temp. increased with the time of heating first rapidly and then more slowly.  $\Delta T$  after heating for 20 min. increases with the water content  $x$  up to  $x = 12\text{-}20\%$ , decreases to a min. at  $x = 20\text{-}26\%$ , again increases to a max. at  $50\text{-}55\%$ , and finally decreases at higher  $x$ . This behavior presumably is due to the effect of  $x$  on the rate of migration of moisture in a temp. field. Different starches gave similar  $\Delta T$ - $x$  curves. After 20 min. heating at  $x = 50\%$ ,  $\Delta T$  increased from amylopectin to native or gelatinized starch, and to dispersed starch. The difference between

starches is attributed to the difference in their elec. cond.  
J. J. Bikerman

A-17 Sci Res Inst. Afc. Ind.

SHUL'MAN, M.S.

The electrochemistry of starch. III. Electric conductivity of starch  
solution in different conditions of gelatinization and aging. Kolloid.  
Zhur. 15, 216-18 '53. (MLRA 6:5)  
(CA 47 no.18:9108 '53)

SHULMAN, M.S.

USSR

The structure of starch. IV. Dielectric properties of native and disperse starch of different degrees of hydration. M. S. Shul'man and S. M. Lipatov (Sci. Research Inst. Bilkh-Imt., Moscow). *Kolloid. Zhur.* 16, 470-3; *Colloid J. (U.S.S.R.)* 16, 445-7(1954)(Engl. translation); cf. *Kolloid. Zhur.* 8, 452(1948); *C.A.* 44, 11137g.—At a given wt. concn., the dielec. const.  $\epsilon$  of aq. solns. of starch (native, disperse, or sol.), dextrin, maltose, and glucose was identical; thus, the dipole moment of the polar groups was independent of the mol. wt. of the polymer. Also the imaginary part of  $\epsilon$  was identical for starch and glucose solns. The  $\epsilon$  of moist solid starch increased with the moisture content  $i$ ; at a given  $i$  it was least for starch < starch monacetate < starch diacetate < starch triacetate. The variation of  $\epsilon$  with temp. was different for different  $i$ ; at large  $i$  an increase of  $\epsilon$  at, e.g., 60° indicated start of gelatination.

J. J. Bikerman

"APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2

SHUL'MAN, M.S.; FERTMAN, G.I.

Physical and chemical principles of saccharification processes.  
Sprint.prom. 20 no.2:13-15 '54.  
(Sugar) (Starch) (MLRA 7:6)

APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2"

SHUL'MAN, M.S.

✓ The production of spirits from colloidally dispersed starch materials. S. M. Lipatov, M. S. Shul'man, and R. Yu. Svetnik. Trudy, Vsesoyuz. Nauch.-Issledovatel. Inst. Spirit. Prom. 1955, No. 5, 18-32, cf. C.A. 44, 111374. — On the basis of phys.-chem. studies of the properties of starch dispersed with the use of the colloid mill it is concluded that

such mech. treatment disintegrates cryst. starch to an amorphous condition. Fermentation expts. on oats and barley so prepd. showed an increase in the alc. yield of 4% to 7%. H. L. Olin.

SHUL'MAN, M. S.

✓ 1252. A polarographic method for determining aldehydes in ethanol. M. S. Shul'man and O. F. Gavrilova. *Tr. Vses. Naučno-Issled. Spets. Promyshlennosti*, 1955, (5), 176-178; *Ref. Zhur. Khim. 1956*, Abstr. No. 43,588.—The content of formaldehyde, acetaldehyde and furfuraldehyde in ethanol is determined polarographically in the presence of NaOH, KOH or LiOH. Ethanol is diluted to a 50 to 70% concn., to 10 ml of which 1 ml of N alkali is added; this mixture is polarographed without the removal of O. In determining acetaldehyde, LiOH is used as background; for furfuraldehyde, NH<sub>4</sub>Cl, KOH, NaOH or LiOH; and for formaldehyde, NaOH, KOH or LiOH is used. With LiOH as background it is possible to determine acet aldehyde and furfuraldehyde together. The error is  $\pm 0.0003\%$  (abs.). R. Lord

*Shulman, M.S.*

Distr: 1243/USC/CEd

The effect of stoichiometric deviations on the dielectric properties of barium titanate / N. S. Novosil'tsev, A. L. Khodakov, and V. S. Gutman. *Trudy Nauch.-Issledovatel'skogo Inst. Rast. i Tekhn. Difraktsii* 1956, No. 27, p. 21.

(1956); *Refl. Zhar., Khim.* 1956, Abstr. No. 23104; cf. C.A. 49, 8876f.—The dielec. properties of BaTiO<sub>3</sub> ceramics with a stoichiometric deviation of BaO to TiO<sub>2</sub> in the limits 1.024 to 0.940 are investigated. It is found that the majority of the properties depend basically on the compn. (with the exception of the Curie point and the frequency effect on  $\epsilon$ ) which explains the disagreement in results in Ba titanate investigation by different authors. The use of chemically pure materials for prep. BaTiO<sub>3</sub> is difficult because of the bad sintering of the samples. The presence of admixts. helps the sintering but destroys the stoichiometric ratio. It is established that in high-frequency fields with potentials up to 0.5 kv./cm., the dielec. const. and its temp. dependence are scarcely affected by the field potential. At 50 cycles,  $\epsilon$  and its temp. dependence are considerably affected by the field gradient, especially at 5.0 kv./cm. In fields to 6 kv./cm. for all compns. no curve distortion, caused by nonlinearity, is observed. After subjection to strong fields of industrial frequency, the  $\epsilon$  and tan  $\delta$  rise by about 4-8%. This after-effect and its relaxation time depend on the compn.

N. Vasileff

SHUL'MAN, M. S.

Study of the adsorptive capacity of carbohydrate solutions by the polarographic method / M. S. Shul'man (All-Union Sci. Research Inst. Alcohol Ind., Moscow). Kolloid Zsh., 19, No. 6 (1957). — The polarographic max. at the reduction of  $O_2$  to  $H_2O$  in 0.02*N* KCl was little depressed by arabinose and glucose even when their concn. was 0.1%; sucrose and maltose were more effective; and dextrin, native starch, and gelatinized starch fully depressed the max. in about 0.07% concn. J. J. Bikerman

SHUL'MAN, M.S.; GAVRIKOVA, O.F.

Determining acids and esters in alcohol. Spirt. prom. 23 no. 2:16-17  
(MIRA 10:4)  
'57.

1. Vsesoyuznyy nauchno-issledovatel'skiy institut spirtovoy pro-  
myshlennosti (for Shul'man). 2. Rosglavspirt (for Gavrikova).  
(Acids--Analysis) (Esters--Analysis) (Alcohol--Analysis)

The accepted Soviet standard method GOST 5964-51 is changed. The titrations are done at 45-50°, and phenolphthalein (I) is replaced by bromo-thymol blue (II). The error introduced, as I changes at different pH than II, is actually compensated by the fact that in the method described the last amounts of the higher esters are never completely hydrolyzed. Two tables show that this rapid modified method furnishes values acceptable for plant use.

SHUL'MAN, M.S.; GAVRIKOVA, O.F.; Prinimala uchastiye: ABROSIMOVA, V.K.

Determining pentoses and pentosans in the molasses beer of the distilling industry. Trudy TSNIISP no.6:163-166 '58. (MIRA 14:12)  
(Pentoses) (Pentosans)

SHUL'MAN, M.S.; SAMOKHVALOV, L.A.

Polarographic analysis in the hydrolysis and sulfite alcohol industries.  
Polarographic analysis in the hydrolysis and sulfite alcohol industries.  
Gidroliz. i lesokhim.prom. 11 no.8:17-19 '58. (MIRA 11:12)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut spirtovoy promyshlennosti (for Shul'man). 2. Vsesoyuznyy nauchno-issledovatel'skiy institut gidroliznoy i sul'fitno-spirtovoy promyshlennosti (for Samokhvalov).  
(Polarography) (Yeast) (Chemistry, Analytical)

SHUL'MAN, M.S.; SEMEVSAYA, V.Ye.

Polarographic determination of sugars in sugar beet molasses.  
Sprint. prom. 24 no. 4:13-15 '58. (MIRA 11:7)  
(Molasses)  
(Sugars)

SHUL'MAN, M.S.

SHUL'MAN, M.S.

Polarographic analysis of carbohydrates. Sakh. prom. 32 no.1:35-37  
(MIRA 11:2)  
Ja '58.

1. Vsesoyuznyy nauchno-issledovatel'skiy institut spiritovoy promysh-  
lennosti.  
(Polarograph and polarography) (Sugars--Analysis and testing)

SHUL'MAN, M. S.; OSHMYAN, G. L.; GAVRIKOVA, O. F.; Prinimala uchastiye:  
GUSEVÀ, A. A.

Methods of determining aldehydes in alcohols kept in barrels  
made of oak. Trudy TSNIISP no.7:150-153 '59. (MIRA 13:9)  
(Aldehyde) (Alcohol)

SHUL'MAN, M.S.; SEMEVSKAYA, V.Ye.

Determination of molasses sugars by the polarographic method.  
Trudy TSNIISP no. 8:99-107 '59. (MIRA 14:1)  
(Molasses) (Sugars)

"APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2

SHUL'MAN, M.S.; SEMEVSKAYA, V.Ye.

Certain properties of the nonsugars of molasses. Trudy TSNILSP  
no. 8:107-110 159.  
(MIRA 14;1)  
(Molasses—Analysis)

APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2"

SHUL'MAN, M.S.; GAVRIKOVA, O.F. [deceased]

Conductometric analysis of the acidity of beer and yeasts.  
Trudy TSNIISP no. 8:110-116 '59. (MIRA 14:1)  
(Conductometric analysis) (Alcohol)

FERTMAN, Grigoriy Isaakovich; SHUL'MAN, Mark Solomonovich; SMIRNOV, V.A.,  
prof., retsenzent; RAYEV, Z.A., kand.tekhn.nsuk, retsenzent;  
KOVALEVSKAYA, A.I., red.; SOKOLOVA, I.A., tekhn.red.

[Physicochemical principles of the production of alcohol] Fiziko-  
khimicheskie osnovy proizvodstva spirta. Moskva, Pishchepromizdat,  
1960. 258 p. (MIRA 13:11)

(Alcohol)

SAMOKHVALOV, L.A.; SHUL'MAN, M.S.

Polarographic analysis in hydrolysis and sulfite alcohol production processes. Report No.2: Investigating the process of solution of oxygen during the cultivation of yeasts. Gidroliz.i lesokhim.prom. 13 no.4:4-7 '60. (MIRA 13:?) (Kansk-Yeast) (Oxygen--Analysis)

"APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2

STEPANISHCHEV, K.P.; SHUL'MAN, M.S.

Apparatus for the continuous dialysis of ferments in  
solutions. Spirt.prom. 26 no.1:5-9 '60. (MIRA 13:6)  
(Electrodialysis) (Enzymes)

APPROVED FOR RELEASE: 08/09/2001

CIA-RDP86-00513R001550130013-2"

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(Starch)

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(Fermentation)

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